April 5, 1932. L. JENSEN ET AL 1,852,655

WEB FOLDING MECHANISM

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Fig. 1

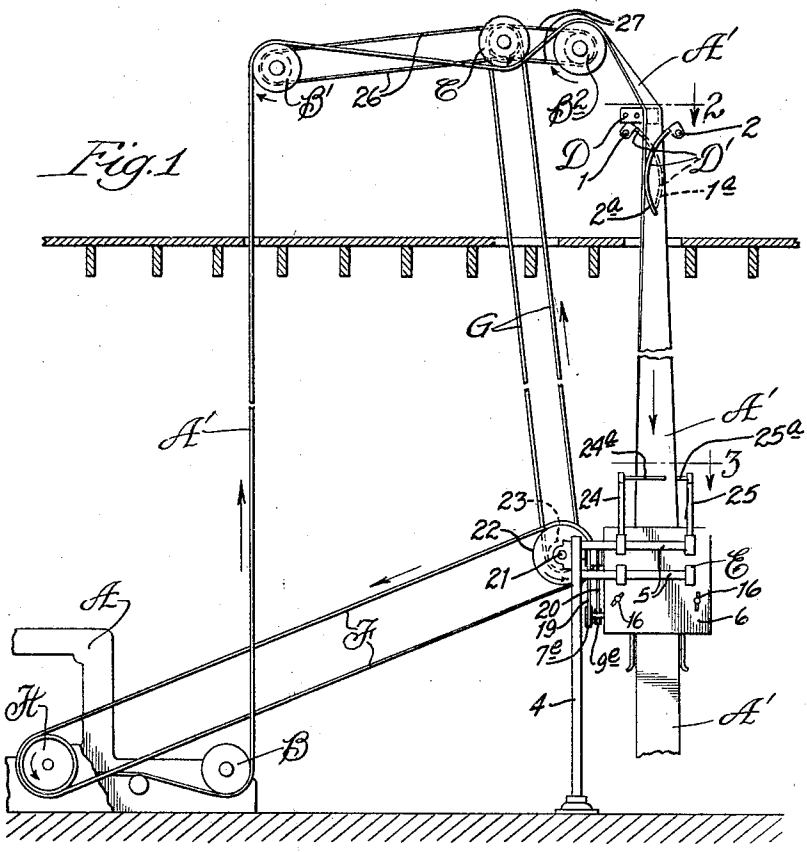

Fig. 2

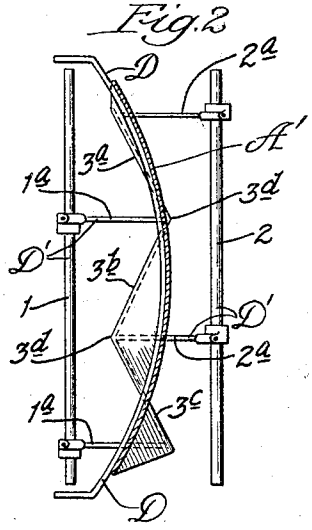

Fig. 3

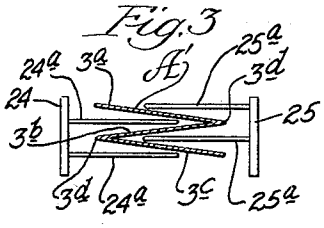

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Fig. 4

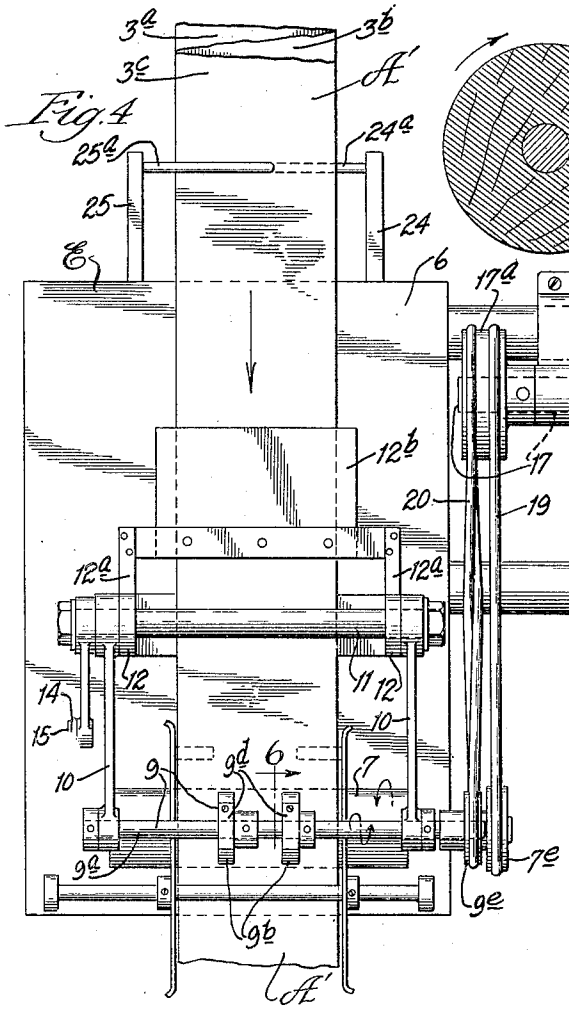
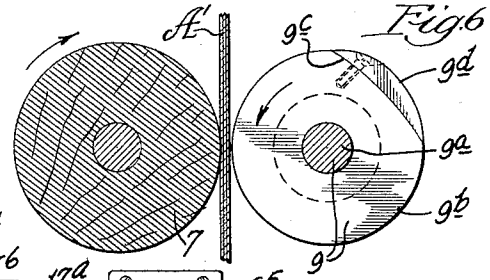


Fig. 6



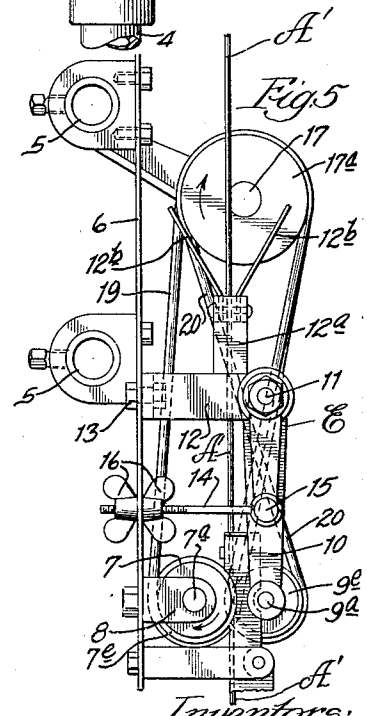


Fig. 5

Fig. 7

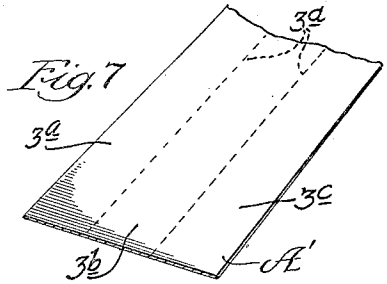
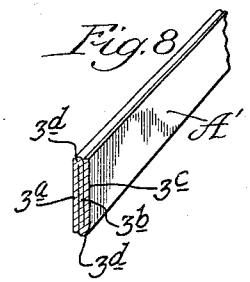


Fig. 8



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1,852,655

UNITED STATES PATENT OFFICE

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WEB FOLDING MECHANISM

Application filed July 12, 1929. Serial No. 377,804.

This invention relates particularly to mechanism for producing longitudinal folds in a web of paper.

The invention is particularly useful in folding, in zig-zag manner, a web comprising printed forms, thus producing a manifolding strip, in which the portions comprising the original and copy-strips are arranged in superposed position.

Such a web may be taken directly from a printing press, if desired; and after the longitudinal folding has been effected, the multiple-ply strip may, if desired, be delivered to a folding machine and folded transversely in zig-zag manner to produce a packet.

On the other hand, the multiple-ply strip may, instead of being taken to a folding machine, be wound into a roll, if desired.

The primary object of the present invention is to provide a simple mechanism capable of operating at high speed and effectively folding a web longitudinally, such mechanism operating with certainty and with little or no danger of injuring the product.

The invention is illustrated in a preferred embodiment in the accompanying drawings, in which—

Fig. 1 is an elevational view illustrating the improved mechanism installed in a factory (shown in section), the web being taken from a printing press (shown brokenly); Fig. 2, a plan view taken as indicated at line 2 of Fig. 1; Fig. 3, a plan view taken as indicated at line 3 of Fig. 1; Fig. 4, an enlarged broken elevational view illustrating the feed means located near the delivery end of the apparatus; Fig. 5, a view taken at right angles to the view shown in Fig. 4; Fig. 6, an enlarged sectional view taken as indicated at line 6 of Fig. 4; Fig. 7, a broken perspective view of the web to be folded; and Fig. 8, a broken perspective view of the web in folded condition.

In the preferred embodiment illustrated, A designates a printing press from which a web A′ is taken; B, B′ and B^2 designate pulleys, or rollers, over or about which the web is carried; C, a propelling roller which aids in the feeding movement of the web; D, a sector-like guide over which the web passes; D′, initial folding devices associated with the guide D; E, a final feed device at or near the delivery end of the apparatus; and F and G, belts, or chains, connecting the roller C and the rollers of the final feed devices E with the press.

The printing press A may be of any suitable form. Ordinarily, such a press is provided with plates, or forms, for printing alternate sections of the web on opposite sides, so that when the web is folded longitudinally in zig-zag manner the printed forms on each section of the strip will be on the upper side thereof. If desired, the printed web may be delivered from the printing press to a roll, and the web to be folded may then be taken from such roll.

It may be assumed that the rollers B, B′ and B^2 are idlers and that the shaft H which drives the belt, or chain, F is geared to the mechanism which feeds the web A′ through the printing press. The roller C is preferably operated at a slightly faster surface speed than the rollers, or cylinders, of the printing press.

The device D is in the form of a stationary curved member forming a portion of a circle of large diameter, so that the web A′ is given a transverse curvature as it passes over the segment, drawn by the forwarding mechanism E. In a plane slightly below the sector D is a pair of fixed horizontal shafts 1 and 2 which are equipped with depending curved arms 1^a and 2^a, respectively. These shafts and curved arms constitute the device D′ which is of a character to effect the initial folding of the web. It will be noted from Fig. 2 that the arms 1^a bear a staggered relation with respect to the arms 2^a. In the illustration given, the web comprises three sections, designated 3^a, 3^b and 3^c. The two lines of folding are indicated at 3^d.

The mechanism E which effects the forwarding of the web in the final folding at or near the discharge end of the apparatus comprises a frame, or support, 4 equipped with a pair of fixed horizontal tubular members 5 carrying a fixed vertical plate 6; a feed-roller

7 journalled in a bracket, or brackets, 8 projecting from the lower portion of the plate 6; a companion feed-device 9 comprising a shaft 9^a and feed-disks 9^b mounted thereon, the shaft 9^a being journalled in the lower ends of arms 10 which depend from a fixed pivot shaft 11 carried by a bracket 12 which is secured to the plate 6 by screws, or bolts, 13; adjustable securing means 14 connecting the cross-bar 15 by means of which the arms 10 are connected with the plate 6, said means comprising a bolt equipped with clamping nuts 16 which engage opposite sides of the plate 6, the bolt 14 extending freely through a perforation in the plate 6; upwardly extending members, or arms, 12^a carried by the bracket 12, said arms having secured thereto spaced diverging plates 12^b which afford a throat through which the strip of paper passes; pulleys 7^e and 9^e adapted to actuate the rollers 7 and 9, respectively; a shaft 17 journalled in a bracket 18 carried by the upper member 5, the shaft 17 being equipped with a pulley 17^a which serves to actuate the straight and crossed belts 19 and 20, which, in turn, operate the pulleys 7^e and 9^e; and a shaft 21 geared to the shaft 17, said shaft 21 being equipped with pulleys 22 and 23 which are engaged, respectively, by the belts, or chains, F and G.

As appears from Fig. 6, the peripheries of the disks 9^b are so spaced with relation to the roller 7 as to confine the folded strip A′ rather closely, but without exerting gripping action thereon. Each disk 9^b has a cutaway part 9^c to which is secured a leather-segment 9^d.

The leather-segments 9^d intermittently exert a forwarding action upon the strip. Preferably, they are so set as to cause a light gripping action when they come into registration with the roller 7. Such gripping action may be light or hardly noticeable. In any event, the segments operate to produce a downwardly striking force upon the strip, which may be sufficient by reason of the impact and friction to keep up the desired feeding action.

The feed-rolls 7 and 9 preferably have a somewhat higher speed than the roller C. By means of the bolt 14, the distance between centers of the rollers 7 and 9 may be adjusted.

Rising from the upper shaft 5 of the device E are standards 24 and 25 which carry fingers 24^a and 25^a (Fig. 3). These fingers serve as guides for the partially folded strip A′. These fingers are set more closely together than are the fingers 1^a and 2^a of the device shown in Fig. 2, so that the sections of the strip being folded are brought nearer to parallelism before passing between the final feed-rolls 8 and 9.

The rolls B′ and B^2 preferably are driven, as by means of belts 26 and 27.

From the illustrations and description given, it will be understood that the web A′, from the time it leaves the printing press, or source of supply, is carried through the folding apparatus without the use of continuously acting gripping feed-rollers. Rather, the web is wafted along, or propelled, by frictional contact with the moving surfaces of the rollers, but rather loosely carried by the rollers.

In the final feeding mechanism E, in which the sections of the web are brought into close parallelism, the curved, slightly eccentric, leather-segments 9^a strike the web intermittently with a downwardly forwarding action. Nevertheless, the web is essentially free from gripping by the feed-rollers practically all the time. The success which has been attained with the apparatus is attributed largely to the freedom of movement of the web, the gradual folding which is effected, and the wafting action of the propelling devices employed.

It has been found desirable in practice to make provision for a long descent of the web between the initial folding devices D and D′ and the final feeding and folding device E. Where the press A is located on the ground floor, for example, the web may be carried upwardly from the printing press to a second story where the devices D and D′ are located, the device E being located a little above the ground floor.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

What we regard as new, and desire to secure by Letters Patent, is:

1. Mechanism for producing longitudinal folds in a web, comprising: means for carrying the web without gripping and producing gradual longitudinal folds in the web; and intermittently-positive feed means near the delivery-end comprising periodically-engaging web-forwarding devices which leave the web wholly free at intervals.

2. Mechanism for producing longitudinal folds in a web, comprising: means for feeding the web without gripping and producing gradual longitudinal folds in the web; and feed means near the delivery-end comprising forwarding devices which normally loosely confine the forwarded strip but intermittently exert a positive forwarding action thereon.

3. Mechanism for producing longitudinal folds in a web, comprising: a curved segment and associated folding fingers for effecting initial folds in the web; and feed means receiving the web therefrom comprising moving devices which loosely confine the folded strip and exert a general forwarding action thereon, and associated means which intermittently exerts a striking, and periodically-positive forwarding action on the folded web.

4. In mechanism for effecting longitudinal

folding of a web, a pair of opposed feed-rollers normally confining the folded web loosely, one of said feed-rollers being equipped with a segment which intermittently exerts a striking action in a forwarding direction upon the folded web and advances said web positively while engaged therewith.

5. In apparatus of the character set forth: means for carrying a web through an elevated course; an initial folding device associated therewith; and feeding and folding mechanism below said initial folding device, comprising rotating rollers which normally confine the folded web loosely between them, one of said rollers being equipped with a periodically-acting striking-member which serves as an intermittently-positive forwarding-member.

6. In apparatus of the character set forth: means for carrying a web through an elevated course; an associated curved segment and folding-fingers below and adjacent said segment; and a final feeding and folding device disposed at a distance below said fingers and comprising more closely set folding-fingers and a pair of feed-rolls beneath said last-mentioned fingers set to normally confine the folded strip loosely, said feed-rolls having associated therewith an intermittently acting striking-member which serves as an intermittently-positive forwarding-member.

7. In apparatus of the character set forth: means for freely supporting and exerting a forwarding action upon a web; means for producing initial folds in the web; and a final feeding and folding device comprising a throat-like passage and feed-rolls below said passage loosely confining the folded strip and exerting a forwarding action thereon.

8. In apparatus of the character set forth: means for freely supporting and exerting a forwarding action upon a web; means for producing initial folds in the web; and a final feeding and folding device comprising a throat-like passage and feed-rolls below said passage loosely confining the folded strip and exerting a forwarding action thereon, one of said feed-rolls being equipped with a striking segment which exerts forwarding action upon the folded strip.

9. In combination: a printing press; means for carrying a web from said press and exerting a forwarding action upon the web without close confinement thereof; means for effecting initial folds in the web; and intermittently-positive feeding and folding means comprising periodically-striking web-forwarding devices.

10. In apparatus of the character set forth: a supporting-frame; a feed-roller journalled therein; a swinging frame-member adjustably connected with said supporting-frame; a feed-roll journalled in said swinging-frame; and actuating means comprising a rotating shaft mounted on said supporting-frame; and pulley and belt connections between said shaft and said feed-rolls serving to rotate said rolls in opposite directions.

11. The method of folding a web longitudinally, which comprises: carrying the web and effecting gradual folds therein without exerting gripping action thereon, and passing the web between forwarding confining-members which normally leave the web free from gripping but intermittently exert a striking, forwarding action upon the folded web.

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